

**REMARKS**

Claims 1, 5, 6 and 9 are amended. The amendment to Claim 1 is to clarify the nature of the hydrofluoric acid-containing vapor and is not intended to alter the scope of Claim 1. The amendment to Claim 5 is supported by the specification, for example, at page 28, lines 9-12. The amendment to Claim 6 is supported by the specification, for example, at page 10, lines 13-23 and Figure 1. The amendment to Claim 9 is supported by the specification, for example, at 30, lines 6, through page 33, line 15, and Figure 6.

New Claims 10-11 are added. New Claim 10 is supported by the specification, for example, at the claims as originally filed and at page 9, line 4, through page 12, line 23. New Claim 11 is supported by the specification, for example, at page 10, lines 13-23 and Figure 1.

No new matter is added by the amendments and new claims.

Upon entry of the amendment, Claims 1-11 are pending.

**Rejection Under 35 U.S.C. § 112, second paragraph**

Claims 1-5 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

The Office Action objects to the use of the phrase "residual hydrofluoric acid" as recited in Claim 1 because it is allegedly unclear whether the phrase refers to vapor that was contacted with dissolution water or to vapor that was not contacted or remains after the contacting. Claim 1 is amended to recite that the residual hydrofluoric acid-containing vapor has not been dissolved in the dissolution water and remains undissolved in the dissolution step. In view of this amendment, Applicants submit that Claim 1 clearly identifies the nature of the recited residual hydrofluoric acid. Accordingly, Applicants respectfully request removal of the rejection of Claim 1.

Claim 6 has not been rejected under this section. However, Claim 6 and new Claim 10 both recite "residual hydrofluoric acid." With the intention of expediting prosecution, Claims 6 and 10 also contain the above-described added language. Accordingly, Applicants submit that these claims are clear and definite as written.

The Office Action objects to recitation of alkali-containing water in the separation step without previous recitation of alkali. Claim 5 is amended to indicate that the neutralization step

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is performed with an alkali. Applicants submit that Claim 5, as amended, is clear and definite and respectfully request removal of the rejection of Claim 5.

Claim 9 has not been rejected under this section. However, Claim 9 recites "neutralizing" and "alkali-containing water." With the intention of expediting prosecution, Claim 9 also contains the above-described added language. Accordingly, Applicants submit that this claim is clear and definite as amended.

**Rejection Under 35 U.S.C. § 102(b)**

Claims 6-9 have been rejected under 35 U.S.C. § 102(b) as being unpatentable over Chlanda *et al.* (U.S. Pat. No. 3,787,304).

Applicants respectfully traverse the rejection.

The Office Action indicates that Claims 6-9 are replete with functional, descriptive language, and that the claims have been given their broadest reasonable interpretation. In order to further clarify Applicants' claimed device, Applicants have amended the claims herein to recite additional structural elements. Applicants submit that these structural elements are neither disclosed, nor taught or suggested, by the cited references.

Claim 6, as amended, further recites a hydrofluoric acid vapor supply line for supplying the hydrofluoric acid-containing vapor from the hydrofluoric acid concentrator to the water contactor. Thus, the claim now recites the structural element of a supply line indicating the connectivity of the hydrofluoric acid concentrator and the water contactor. Claims 7 and 8 depend from Claim 6, and, therefore, also contain this additional structural element.

Claim 9, as amended, recites a vapor supply line for supplying the hydrofluoric acid-containing vapor from the first concentrator to the condenser; a condensate outlet line for supplying the condensate from the condenser to the second concentrator; and an alkali supply line for supplying alkali from the neutralizer to at least one of the vapor supply line, condenser, condensed water outlet line, and second concentrator. Thus, Claim 9 now recites several additional structural elements of various lines indicating the connectivity of various recited elements.

Chlanda discloses an apparatus for recovery of fluorine from fluosilicic acid aqueous streams by electrodialytic water-splitting of fluoride salt, which can be optionally followed by

concentration of the hydrofluoric acid formed in the electrolysis. Thus, Chlanda discloses an apparatus configured such that fluosilicic acid is first treated with potassium hydroxide, and, subsequent to formation of the hydrofluoric acid, the hydrofluoric acid is optionally concentrated. The Office Action points to column 4, line 24 of Chlanda as disclosing a HF concentrator. Applicants presume that the Office Action is referring to still 18 of Figure 1. The Office Action further points to mixer-settler 3 of Figure 1 as the water contactor. As is clear from Figure 1, no vapor supply line exists that supplies hydrofluoric acid-containing vapor from the hydrofluoric acid concentrator to the water contactor. Thus, Chlanda does not disclose a device in which a hydrofluoric acid concentrator is connected via a vapor supply line to a water contactor. As such, Chlanda does not disclose the device of Claim 6. Furthermore, Chlanda does not disclose vapor supply line for supplying the hydrofluoric acid-containing vapor from a first concentrator to a condenser, a condensate outlet line for supplying the condensate from the condenser to a second concentrator, or an alkali supply line for supplying alkali from the neutralizer to at least one of the vapor supply line, condenser, condensed water outlet line, and second concentrator. Accordingly, Chlanda does not disclose the device of Claim 9.

**Rejection Under 35 U.S.C. § 102(e)**

Claims 6-9 have been rejected under 35 U.S.C. § 102(e) as being unpatentable over Kurokawa *et al.* (U.S. Pat. No. 6,379,548).

Applicants respectfully traverse the rejection.

Kurokawa discloses a system for recovering and treating waste water where fluorine is converted from NaF to  $\text{CaF}_2$  which has low solubility, resulting in a sludge that is removed, dried and disposed of. In Kurokawa, no vapor supply line exists that supplies hydrofluoric acid-containing vapor from a hydrofluoric acid concentrator to a water contactor. Thus, Kurokawa does not disclose an apparatus in which a hydrofluoric acid concentrator is connected via a vapor supply line to a water contactor. As such, Kurokawa does not disclose the device of Claim 6. Furthermore, Kurokawa does not disclose vapor supply line for supplying the hydrofluoric acid-containing vapor from a first concentrator to a condenser, a condensate outlet line for supplying the condensate from the condenser to a second concentrator, or an alkali supply line for supplying alkali from the neutralizer to at least one of the vapor supply line, condenser,

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condensed water outlet line, and second concentrator. Accordingly, Kurokawa does not disclose the device of Claim 9.

**Rejection Under 35 U.S.C. § 103(a)**

Claims 7-9 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Kurokawa in view of Chlanda.

Applicants respectfully traverse the rejection.

As discussed above, Kurokawa teaches a system for recovering and treating waste water where fluorine is converted from NaF to  $\text{CaF}_2$  which has low solubility, resulting in a sludge that is removed, dried and disposed of. Thus, Kurokawa teaches a system for the removal of fluoride ions as a solid. Nothing in Kurokawa teaches or suggests the device of Claim 6, in which a hydrofluoric acid vapor supply line supplies the hydrofluoric acid-containing vapor from the hydrofluoric acid concentrator to the water contactor because Kurokawa provides no motivation for a device in which hydrofluoric acid-containing vapor is generated, much less any motivation for a device that further treats such vapor. Instead, Kurokawa teaches a device in which solid  $\text{CaF}_2$  is evaporated to dryness, and no hydrofluoric acid-containing vapor is generated. Accordingly, Kurokawa provides no teaching or suggestion to modify the device taught in Kurokawa in order to arrive at the device of Claim 6, or any claim dependent therefrom.

Chlanda does not teach or suggest that which is missing in Kurokawa. Chlanda teach first forming a fluorine-containing salt precipitate in settler 3 (identified by the Office Action as the water contactor), and then, at the very final step, concentrating hydrogen fluoride in still 18. Thus, the device of Chlanda is designed to manipulate fluorine-containing salts, and has as its final component a still in which hydrogen fluoride is concentrated. Nothing in Chlanda teaches or suggests the device of Claim 6, in which a hydrofluoric acid vapor supply line supplies the hydrofluoric acid-containing vapor from the hydrofluoric acid concentrator to the water contactor because Chlanda provides no motivation for a device in which hydrofluoric acid-containing vapor is generated, much less any motivation for a device that contacts such vapor with water. Accordingly, Chlanda provides no teaching or suggestion to modify the device taught in Chlanda or Kurokawa in order to arrive at the device of Claim 6, or any claim dependent therefrom.

In view of the above, Applicants submit that Claim 6, and Claim 7 and 8 which depend from Claim 6, are not obvious over Chlanda and Kurokawa because the references, alone or combined, do not teach or suggest the device of Claim 6.

Applicants also submit that Claim 9, as amended, is not taught or suggested by Chlanda or Kurokawa, alone or combined.

Claim 9, as amended, recites a vapor supply line for supplying the hydrofluoric acid-containing vapor from the first concentrator to the condenser; a condensate outlet line for supplying the condensate from the condenser to the second concentrator; and an alkali supply line for supplying alkali from the neutralizer to at least one of the vapor supply line, condenser, condensed water outlet line, and second concentrator. Thus, Claim 9 now recites several additional structural elements of various lines indicating the connectivity of various recited elements.

As discussed above, Kurokawa teaches a device in which solid  $\text{CaF}_2$  is evaporated to dryness, and no hydrofluoric acid-containing vapor is generated. Kurokawa does not teach or suggest a vapor supply line for supplying hydrofluoric acid-containing vapor from a first concentrator to a condenser, nor a condensate outlet line for supplying the condensate from the condenser to a second concentrator, nor an alkali supply line for supplying alkali from the neutralizer to at least one of the vapor supply line, condenser, condensed water outlet line, and second concentrator. Accordingly, Kurokawa does not teach or suggest Claim 9 as amended.

Chlanda does not teach or suggest that which is lacking in Kurokawa. As discussed above, the device of Chlanda is designed to manipulate fluorine-containing salts, and has as its final component a still in which hydrogen fluoride is concentrated. There is no teaching or suggest in Chlanda to connect various components recited in Claim 9 according to the recited supply lines and outlet line because Chlanda provides no motivation for a device in which hydrofluoric acid-containing vapor is generated, much less any motivation for a device that condenses such vapor and supplies the condensate to a second concentrator. Accordingly, Chlanda provides no teaching or suggestion to modify the device taught in Chlanda or Kurokawa in order to arrive at the device of Claim 9.

New Claims

New Claims 10 and 11 are added herein. Applicants submit that these claims also are non-obvious over the cited references.

Claim 10 is directed to a hydrofluoric acid wastewater treatment device for treating wastewater containing hydrofluoric acid, comprising a hydrofluoric acid concentrator for concentrating hydrofluoric acid wastewater by evaporation to produce a concentrated hydrofluoric acid water and a hydrofluoric acid-containing vapor; a water contactor configured to receive the hydrofluoric acid-containing vapor from the concentrator and bring the hydrofluoric acid-containing vapor into contact with dissolution water to dissolve the vapor; an alkali contactor for bringing the residual hydrofluoric acid-containing vapor that has not been dissolved in the dissolution water and remains undissolved in the water contactor into contact with an alkali to produce a neutralized liquid and a dehydrofluorinated vapor; and a condenser for condensing the dehydrofluorinated vapor obtained by the alkali contactor to produce condensed water.

Claim 10 is novel and non-obvious over the cited references because the references, alone or in combination, do not teach or suggest a water contactor configured to receive hydrofluoric acid-containing vapor from a concentrator and bring the hydrofluoric acid-containing vapor into contact with dissolution water to dissolve the vapor. As discussed above, Kurokawa teaches a device in which solid  $\text{CaF}_2$  is evaporated to dryness, and no hydrofluoric acid-containing vapor is generated, and the device of Chlanda is designed to manipulate fluorine-containing salts, and has as its final component a still in which hydrogen fluoride is concentrated. Neither reference teaches or suggests a water contactor configured to receive hydrofluoric acid-containing vapor from a concentrator and bring the hydrofluoric acid-containing vapor into contact with dissolution water to dissolve the vapor because neither references provides motivation for a device in which hydrofluoric acid-containing vapor is generated, much less any motivation for suggest a water contactor configured to receive hydrofluoric acid-containing vapor from a concentrator.

Claim 11 depends from Claim 6 and further recites a return line for supplying the hydrofluoric acid-containing vapor solution from the water contactor to the hydrofluoric acid concentrator. Thus, Claim 11 is novel and non-obvious over the cited references for at least the reasons supporting the novelty and non-obviousness of Claim 6.

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### CONCLUSION

In light of the Applicant's foregoing Remarks, it is respectfully submitted that the present application is in condition for allowance. Should the Examiner have any remaining concerns which might prevent the prompt allowance of the application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below.

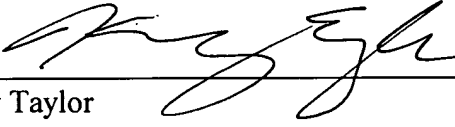
Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

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